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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicants: Roger R. Lesieur et al
Serial No.: 10/091,223
Filed: March 5, 2002
For: "Autothermal Fuel Gas Reformer Assemblage"

Docket No.: C-2351DIV
Group: 1764
Examiner: A. Doroshenk

SUPPLEMENTAL APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:
This is a supplemental appeal brief which is responsive to the office action dated April 19, 2004. In the office action in question, the Examiner has set forth a new ground of rejection relating to Claims 3, 4, 8, 12 13 and 17. These claims are now rejected as being anticipated under §102 of the statute instead of being obvious under §103 of the statute. The previous §103 rejection of the remaining claims is unchanged in the office action dated April 19, 2004.

(1) REAL PARTIES IN INTEREST:
International Fuel Cells, LLC, (now UTC Fuel Cells, LLC, by change of name) South Windsor, CT

(2) RELATED APPEALS AND INTERFERENCES:
None.

(3) STATUS OF CLAIMS:
Claims 1-17 were originally submitted for examination. Claims 1 and 2 have been canceled without prejudice and Claims 3-17 have been prosecuted. Claims 3-17 have not been amended. The third rejection of claims 3-17 is appealed herein.

(4) STATUS OF AMENDMENTS:
All amendments to the specification have been entered.

(5) SUMMARY OF THE INVENTION:
This invention (Claims 3-17) relates to a method for mixing a fuel/steam gas with an oxidant

gas to form an essentially homogeneous fuel/steam/oxidant mixture which is suitable for use in an autothermal fuel gas reformer. One of the gas streams flows axially through cylindrical transfer tubes toward an inlet end of a catalyst bed in the reformer. The transfer tubes extend through a manifold and have radial openings which provide radial flow paths from the manifold to the interior of the transfer tubes. The openings are spaced apart from the inlet end of the catalyst bed a distance which is at least two times the diameter of the transfer tubes. The other of the gas streams flows into the transfer tubes through the radial openings. A pressure differential is maintained between the manifold and the interior of the transfer tubes which ensures that the gas stream flowing radially into the transfer tubes from the manifold will be deflected into the axially flowing gas stream when the radially flowing stream penetrates the interior of the transfer tubes a distance which is about one half of the radius of the interior of the transfer tubes. This deflection of the radially flowing gas stream is the result which is sought by the method of this invention.

(6) ISSUES:

A. Is the subject matter of Claims 3, 4, 8, 12, 13 and 17 anticipated by Dunster et al?

B. Is the subject matter of Claims 5-7, 9-11 and 14-16 rendered obvious by the combination of Dunster et al and Fourie et al or O'Connell et al, or Lomax et al?

(7) PATENTABILITY GROUPING OF CLAIMS:

The patentability of Claims 3-17 stand or fall together.

The References Relied Upon

U.S. Pat. No. 4,865,820 Dunster et al;
U.S. Statutory Invention Registration No. H1,849 Fourie et al;
U.S. Pat. No. 6,223,843 O' Connell et al; and
U.S. Pat. No. 6,368,735 Lomax et al.

A Brief Description Of The References

Dunster et al

The Dunster et al reference discloses a gas mixer and distributor for a reactor which may be an autothermal reformer (see Col. 3, line 55). The mixer includes an inlet chamber 68 into which a gas stream P2 (66) flows at a pressure of 400 PSIA and a velocity of 100 ft/sec.. The inlet chamber 68 opens into a plurality of tubes 80. The tubes 80 each include a plurality of radial openings 86 (see FIG. 2) and open into a catalyst bed 32. The gas mixer also includes a manifold 72 into which another gas stream P1 flows at a pressure of 430 PSIA and a velocity of 110 ft./sec.. The intended result of the Dunster et al system is to create a turbulent gas flow stream in the tubes 80. We note that the terms "turbulent" or

"turbulence" occurs six times in the Dunster et al specification; and again in each of the independent claims in Dunster et al. The manner in which the turbulent gas flow result is achieved in Dunster et al is by varying the minimum gas flow velocity in the tubes 80 (see Col. 5, first full paragraph of Dunster et al). Dunster et al produces uniform gas distribution over the inlet to the catalyst bed by reducing the velocity of the gas flow into the catalyst bed by providing diverging passageways 84 at the bottom of the tubes 80 (see the second full paragraph in Col. 5 of the Dunster et al patent, and FIGS. 5 and 7 of the Dunster et al patent).

Fourie et al, O'Connell et al, and Lomax et al

The Examiner is relying on these three references for the same teaching, and that is that gasoline, diesel fuel and methanol are all reformable fuels. Applicants do not dispute that fact. Thus we will not bother to provide a brief description of these three references, which are essentially equivalent to each other as far as the disclosure of reformable fuels goes.

The Rejections

35 USC §102

Claims 3, 4, 8, 12, 13 and 17 stand rejected as being anticipated by Dunster et al. The Examiner has discarded or abandoned the previous §103 rejection which was based on a "result effective variable" standard, and now relies on §102 and alleges inherency regarding the claim limitations that she cannot find in Dunster et al.

In the most recent office action, the Examiner states: "With respect to Claims 3, 8 and 13, Dunster et al discloses a method for mixing a fuel/steam or vaporized fuel with an oxidant gas or oxidant/steam gas +++ suitable for use in an autothermal fuel gas reformer catalyst bed +++ taking place in an apparatus comprising:
a catalyst bed (32) having an inlet end (fig. 5);
a mixing station (30) adjacent to said inlet end of the catalyst bed (fig. 5), said mixing station including an inlet chamber (68), a manifold (72) interposed between said inlet chamber (68) and said catalyst bed (32) inlet end +++; and
a plurality of cylindrical transfer tubes (80) extending through said manifold (72) from said inlet chamber (68) to said inlet end of said catalyst bed +++ each of said tubes having a plurality of gas entry passages (86) in sides (sic, "side") walls of the tubes, each gas passage having an axis which is perpendicular +++ to an axis of the tubes, each passage spaced apart from the catlyst bed inlet end at a distance which is at least two times the diameter of said tubes (see fig. 2).

The method comprising the steps of:
providing a first gas inlet passage (66) opening into the inlet chamber (68);

providing a second gas inlet passage (70) opening into said manifold (72);
introducing a vaporized fuel/steam mixture)col. 3, lines 35-40) into said inlet chamber (68) or manifold (72);
introducing an oxidant gas into the other of said inlet chamber (68) or said manifold (72);
causing one of said fuel/steam mixture or said oxidant stream to flow axially through said transfer tubes toward the inlet of said catalyst bed and causing the other of said fuel/steam mixture or said oxidant stream to flow from said manifold (72) radially into said transfer tubes (80) through said gas entry passages (86) (col. 6, lines 9-13);
maintaining a pressure differential between the interior of the transfer tubes and the manifold which will result in the radially flowing stream entering said tubes to be entrained and deflected into the axially flowing stream (col. 5, lines 10-16).

While Dunster et al does not define the pressure differential in terms of penetration distance of the radially flowing stream into the transfer tube (as applicant does), Dunster et al does teach maintaining a pressure differential which is deemed to provide the same result as the instant invention, that being uniform mixing (reads on a homogeneous mixture) (col. 5, lines 10-22 and col. 6, lines 1-13). Therefore the position is taken that the pressure differential of Dunster et al. will inherently provide applicant's same axial stream penetration.

With respect to claim 4, Dunster et al discloses wherein the pressure differential between the gas stream in said transfer tubes (400 psia) and the gas stream in said manifold (430 psia) is only a few percentage points (col. 7, lines 11-17).

With respect to claims 12 and 17, Dunster et al discloses wherein said fuel or fuel/steam mixture passes axially through said transfer tubes and said oxidant or oxidant/steam mixture enters said transfer tubes (80) from said manifold (72) (col. 7, lines 6-17).".

The aforesaid is a quotation of the grounds for rejecting Claims 3, 4, 8, 12, 13 and 17 put forth on pages 2-4 in the office action dated April 19, 2004.

Claims 5-7, 9-11 and 14-16 have been rejected in the office action dated April 19, 2004. These claims were rejected as being obvious over the combination of Dunster et al and any one of Fourie et al, O'Connell et al or Lomax et al. Since the three secondary references are redundant references, the rejection based on only one combination of them will be quoted below.

"Dunster et al discloses the general reforming of hydrocarbons but does not disclose specific hydrocarbons such as gasoline, diesel fuel and methanol.

Fourie et al discloses wherein gasoline, diesel fuel and methanol are typical reformable fuels (col. 1, lines 23-29). It would have been obvious +++ to select any hydrocarbon recognized for reforming processes in the method of Fourie et al as it is merely the selection of a specific hydrocarbon known to be effective in a reforming process.".

This same reasoning has been presented in support of the Dunster et al - O'Connell et al combination, and the Dunster et al - Lomax et al combination.

(8) THE ARGUMENT

As noted above, all of the rejections of the claims in this application are based in whole or in part on Dunster et al. We will address the §102 and §103 rejections separately here.

THE §102 REJECTIONS:

As noted above, Claims 3, 4, 8, 12, 13 and 17 have been rejected as being anticipated by Dunster et al. In formulating this rejection, the Examiner has relied on a doctrine of inherency relative to the Dunster et al disclosure. As always, in formulating rejections of claims, the Examiner has the initial burden of proof as to the veracity of the rejections.

In Ex parte Levy, 17 USPQ2d 1461 (US PTO Bd. Pat. App. & Int. 1990), the Board held that the initial burden of establishing a *prima facie* basis to deny patentability rests upon the examiner. See also In re Carleton, 202 USPQ 165 (CCPA 1979); and In re Piasecki, 223 USPQ 785 (Fed. Cir. 1984). This burden can only be discharged by establishing a factual basis for the finding of non-patentability. Examiner's conjecture or conclusionary assertions do not provide the necessary factual basis. We note that on page 4, line 7 of the office action, that the Examiner has "deemed" that the claimed penetration distance in the instant case will also result with Dunster et al. The term "deems" means "believes, or thinks, or judges". What an Examiner merely deems, or thinks, or believes, or judges will result from a cited reference's teachings is insufficient to discharge the Examiner's initial burden of proof due to the lack of the necessary factual basis deriving from the cited reference to support the Examiner's beliefs. This amounts to nothing more than Examiner conjecture as to what might result from the application of a reference's teachings.

Regarding inherency, please note the following. An Examiner who asserts inherent disclosure has heavy burden of proving it. It is not sufficient for inherency, that person following disclosure might obtain result set forth in claim, it must invariably happen. Standard Oil Co. (Indiana) v. Montedison, S.p.A, 212 USPQ 327 (CA 3 1981).

The Honorable Board's attention is directed to In re Oelrich and Divigard, 212 USPQ 323 (CCPA 1981) wherein the Court, cites Hansgirg v. Kemmer, 40 USPQ 665 (CCPA

1939), which defines "inherency" as that term applies to rejections of claims. The Court, in Oelrich, states, at 326, that: "Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." (emphasis in original). Thus the limitations recited in Claims 3, 4, 8. 12, 13 and 17 herein must inevitably result from the prior art combination.

In Ex parte Levy, 17 USPQ2d 1461 (US PTO Bd. Pat. App. & Int. 1990), the Board stated that the initial burden of establishing a *prima facie* basis to deny patentability rests upon the examiner; and the examiner, if relying upon a theory of inherency, must provide a basis in fact, or a basis grounded in technical reasoning, to reasonably support the examiner's determination that the allegedly inherent characteristics necessarily flow from the teachings of the applied prior art.

It will be readily appreciated that the law of inherency requires that the allegedly inherent result from the prior art must necessarily, or invariably or inevitably, result from the prior art's teachings. "Deeming" something will happen is simply not enough to satisfy the burden of proof regarding an inherency requirement.

The Examiner argues that Dunster et al discloses wherein the pressure differential between the manifold and the tubes affects the uniformity of the gas flow in the tubes. She cites Col. 5, lines 10-22 to support her position. What that cited portion of the Dunster et al patent actually states is that: "The size of the internal diameter 90 of the tubes 80 as well as the length 94 of the tubes ++++ provide for substantially uniform gas flows through the tubes 80 from the chamber 68" (emphasis added). The cited section of the Dunster et al patent also states that: "Likewise the size of the orifices 86 is selected to provide +++ substantially uniform volumes of gas flows through the orifices 86 into the tubes 80." (emphasis added). This uniform gas flow through the tubes and the orifices results in a turbulent gas flow inside of the tubes, as noted above, and as repeatedly emphasized in Dunster et al.

None of the claims in the instant application relate to the provision of uniform volumes of gas flows or turbulent gas stream flows through either the transfer tubes or the orifices. The Examiner has completely ignored this fact.

What all of the claims in the instant application relate to is the formation of an essentially homogeneous fuel/steam/ oxidant mixture which is suitable for use in an autothermal fuel gas reformer. This homogeneous mixture is created by a pressure differential which exists between the manifold and the interior of the transfer tubes. This pressure differential causes

the gas stream which flows radially into the transfer tubes to deflect into the axial gas flow stream before the radially flowing stream penetrates the interior of the transfer tubes a distance which is about half of the radius of the interior of the transfer tubes. This result is not suggested by Dunster et al.

Dunster et al uses uniform volumes of gas flows through the transfer tubes and the radial openings and also gas flow rates in the transfer tubes in the transfer tubes to create a turbulent flowing gas stream in the transfer tubes. This turbulent flowing gas stream is also the result of the minimum gas velocity within the tubes (see Col. 5, first full paragraph of Dunster et al). This is the first result which is sought in Dunster et al. A second result sought in Dunster et al is the production of a uniform gas distribution over the inlet portion of the catalyst bed. This second result is accomplished by a particular configuration of the tube bores at the ends thereof which feed into the catalyst bed inlet. This second sought result of Dunster et al is described in the second full paragraph of Col. 5 of the patent. To accomplish this second result the tube bores are flared as shown by the numeral 84. These flares 84 will diffuse the turbulence and will result in a uniform gas distrubution over the inlet of the catalyst bed.

It is clear that Dunster et al discloses, for the most part, structural features of the tubes 80, those features, according to Dunster et al, being the size of the internal diameter 90 of the tubes 80, the length 94 of the tubes 80, the size of the orifices 86, the inclusion of the expanding passageways 84 and the angle 98 at which they diverge. These are the structural variables that effect the results desired by Dunster et al. The other feature that Dunster et al refers to is the minimum velocity of gas flow through the tubes 80 that must be present to achieve the results desired by Dunster et al. It is crystal clear in this case that a pressure differential which achieves the results desired by Dunster et al is not suggested by Dunster et al as a key factor.

The §102 rejection based on inherency derived from Dunster et al is clearly erroneous, is not supported by Dunster et al, and the "reasoning" supporting this rejection is not supported by case law. This rejection should be reversed.

THE §103 REJECTIONS:

Claims 5-7, 9-11 and 14-16 have been rejected as being obvious over the combination of Dunster et al in view of three essentially redundant references. The relevancy of Dunster et al to this rejection is the same as the relevancy of Dunster et al to the rejection of Claims 3, 8 and 13, which has been discussed above in the §102 rejection review and argument. The rejection of the independent claims from which these claims depend is flawed, as noted above, since it is based on Examiner's suppostion, and nothing more. Since the

Examiner's analysis of the Dunster et al reference is based on nothing more than Examiner's conjecture or suppostion as to what might happen during the performance of the Dunster et al teachings, and is not supported even by the Examiner by anything more than what the Examiner DEEMS would happen, and in view of the Examiner's analysis of what Dunster et al produces, which is uniform gas FLOWS, not a HOMOGENEOUS MIXTURE, as claimed herein, the §103 rejection is similarly flawed and should be reversed. Uniform gas flows, as described in Dunster et al, and homogeneous gas mixtures, as claimed in the instant application are NOT the same thing. The Examiner's "reads on" conclusionary statement put forth on page 4, line 8 of the office action is clearly erroneous.

SUMMARY

For the reasons advanced above, the Honorable Board is respectfully requested to reverse the rejections of Claims 3-17 in this case.

Respectfully submitted,

William W. Jones
Reg. No. 24,607
Attorney for Applicants
6 Juniper Lane
Madison, CT 06443
(203) 245-2418

Date:_____

(9) APPENDIX:

3. A method for mixing a fuel/steam gas with an oxidant gas to form an essentially homogeneous fuel/steam/oxidant mixture suitable for use in an autothermal fuel gas reformer catalyst bed, said method comprising the steps of:
a) providing an autothermal reformer catalyst bed having an inlet end;
b) providing an air/fuel/steam mixing station adjacent to said inlet end of said catalyst bed, said mixing station including an inlet chamber, a manifold interposed between said inlet chamber and said catalyst bed inlet end;
c) providing a plurality of cylindrical transfer tubes extending through said manifold from said inlet chamber to said inlet end of said catalyst bed each of said cylindrical transfer tubes having a plurality of gas entry passages in side walls of each of said transfer tubes, each of said gas passages having an axis which is perpendicular to an axis of said transfer tubes, each of said gas entry passages being spaced apart from said catalyst bed inlet end a distance which is at least two times the diameter of said cylindrical transfer tubes;
d) providing a first gas inlet passage opening into said inlet chamber;
e) providing a second gas inlet passage opening into said manifold;
f) Introducing a vaporized fuel/steam mixture into one of said inlet chamber or said manifold;
g) introducing an oxidant gas into the other of said inlet chamber or said manifold;
h) causing one of said fuel/steam mixture or said oxidant gas stream to flow axially through said transfer tubes toward said inlet end of said catalyst bed;
i) causing the other of said fuel/steam mixture or said oxidant to flow from said manifold radially into said transfer tubes through said gas entry passages; and
j) maintaining a pressure differential between the interior of said transfer tubes and said manifold which will result in the radially flowing stream entering said transfer tubes to be entrained and deflected into the axially flowing stream in the transfer tubes before the radially flowing stream penetrates the interior of the transfer tubes a distance which is about one-half of the radius of the interior of the transfer tubes.

4. The method of Claim 3 wherein said pressure differential between the gas stream in said transfer tubes and the gas stream in said manifold is only a few percentage points.

5. The method of Claim 3 wherein the fuel is gasoline.

6. The method of Claim 3 wherein the fuel is diesel fuel.

7. The method of Claim 3 wherein the fuel is methanol.

8. A method for mixing a fuel/steam gas with an oxidant gas to form an essentially homogeneous fuel/steam/oxidant mixture suitable for use in an autothermal fuel gas

reformer catalyst bed, said mixing method taking place in a fuel processing apparatus which includes an autothermal reformer catalyst bed having an inlet end, an oxidant/fuel/steam mixing station adjacent to said inlet end of said catalyst bed, said mixing station including an inlet chamber, a manifold interposed between said inlet chamber and said catalyst bed inlet end, and a plurality of cylindrical transfer tubes extending through said manifold from said inlet chamber to said inlet end of said catalyst bed each of said cylindrical transfer tubes having a plurality of gas entry passages in side walls of each of said transfer tubes, each of said gas passages having an axis which is perpendicular to an axis of said transfer tubes, each of said gas entry passages being spaced apart from said catalyst bed inlet end a distance which is at least two times the diameter of said cylindrical transfer tubes, said method comprising the steps of:

a) providing a first gas inlet passage opening into said inlet chamber;

b) providing a second gas inlet passage opening into said manifold;

c) Introducing a vaporized fuel/steam mixture into one of said inlet chamber or said manifold;

d) introducing an oxidant gas into the other of said inlet chamber or said manifold;

e) causing one of said fuel/steam mixture or said oxidant gas stream to flow axially through said transfer tubes toward said inlet end of said catalyst bed;

f) causing the other of said fuel/steam mixture or said oxidant to flow from said manifold radially into said transfer tubes through said gas entry passages; and

g) maintaining a pressure differential between the interior of said transfer tubes and said manifold which will result in the radially flowing stream entering said transfer tubes to be entrained and deflected into the axially flowing stream in the transfer tubes when the radially flowing stream penetrates the interior of the transfer tubes a distance which is about one-half the radius of the interior of the transfer tubes.

9. The method of Claim 8 wherein the fuel is gasoline.

10. The method of Claim 8 wherein the fuel is diesel fuel.

11. The method of Claim 8 wherein the fuel is methanol.

12. The method of Claim 8 wherein said fuel/steam mixture is passed axially through said transfer tubes and said oxidant enters said transfer tubes from said manifold.

13. A method for mixing an oxidant/steam gas with a vaporized fuel to form an essentially homogeneous fuel/steam/oxidant mixture suitable for use in an autothermal fuel gas reformer catalyst bed, said mixing method taking place in a fuel processing apparatus which includes an autothermal reformer catalyst bed having an inlet end, an oxidant/fuel/steam mixing station adjacent to said inlet end of said catalyst bed, said mixing station including an

inlet chamber, a manifold interposed between said inlet chamber and said catalyst bed inlet end, and a plurality of cylindrical transfer tubes extending through said manifold from said inlet chamber to said inlet end of said catalyst bed each of said cylindrical transfer tubes having a plurality of gas entry passages in side walls of each of said transfer tubes, each of said gas passages having an axis which is perpendicular to an axis of said transfer tubes, each of said gas entry passages being spaced apart from said catalyst bed inlet end a distance which is at least two times the diameter of said cylindrical transfer tubes, said method comprising the steps of:

a) providing a first gas inlet passage opening into said inlet chamber;

b) providing a second gas inlet passage opening into said manifold;

c) Introducing a vaporized fuel stream into one of said inlet chamber or said manifold;

d) introducing an oxidant/steam mixture into the other of said inlet chamber or said manifold;

e) causing one of said fuel stream or said oxidant/steam mixture to flow axially through said transfer tubes toward said inlet end of said catalyst bed;

f) causing the other of said vaporized fuel stream or said oxidant/steam mixture to flow from said manifold radially into said transfer tubes through said gas entry passages; and

g) maintaining a pressure differential between the interior of said transfer tubes and said manifold which will result in the radially flowing stream entering said transfer tubes to be entrained and deflected into the axially flowing stream in the transfer tubes when the radially flowing stream penetrates the interior of the transfer tubes a distance which is about one-half the radius of the interior of the transfer tubes.

14. The method of Claim 13 wherein the fuel is gasoline.

15. The method of Claim 13 wherein the fuel is diesel fuel.

16. The method of Claim 13 wherein the fuel is methanol.

17. The method of Claim 13 wherein said fuel stream is passed axially through said transfer tubes and said oxidant/steam mixture enters said transfer tubes from said manifold.

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Docket No.: C-2351DIV
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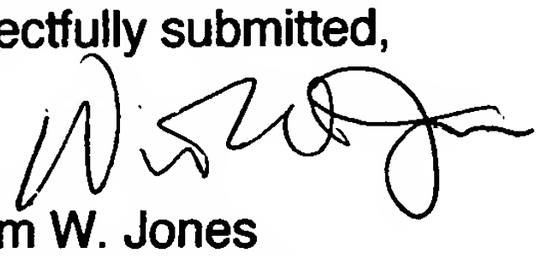
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Enclosed are three copies of a Supplemental Appeal Brief for use in connection with the captioned patent application.

Respectfully submitted,



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